A 2-year follow-up study of incisal tooth wear in dental students

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This report was derived from cross-sectional and longitudinal analyses of prevalence, pattern, and severity of incisal wear in 64 dental students who had virtually complete dentitions at the first examination and unchanged dentitions at the re-examination. They were first examined in 1991 and re-examined after 24 months in 1993. The average age of the students in 1991 was 23 ± 1.7 years. Assessment of incisal wear was made on stone casts based on silicone impression material in accordance with the Incisal wear Index (IwI). The results showed that the prevalence of incisal wear had not changed during the observation period. The severity of incisal wear for maxillary and mandibular central and lateral incisors had remained essentially the same, whereas the severity of wear of maxillary and mandibular canines had increased during the observation period. There was no statistically significant relationship between age and IwI. The wear pattern found for anterior teeth is discussed in relation to the cuspid protection and the group function theories of occlusion. □ *Anterior teeth; dental students; incisal wear*

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The relationship between tooth wear, age, and the number of teeth present (tooth retention) has been studied in populations that permitted grouping on the basis of age and tooth retention (1–4). These cross-sectional studies analyzed various etiologic factors of tooth wear. They also confirmed clinical experience and findings (5, 6) that teeth become more worn as age increases and that tooth wear increases as the number of teeth is reduced. Although age and tooth retention do not provide a full explanation for the prevalence and extent of tooth wear, it may be assumed that the cumulative impact of age and tooth retention is an important factor of tooth wear. This was the premise for the selection of a population group with a high and constant number of teeth present which could be followed over time to study the relative contribution of age to incisal tooth wear (7). The purpose of this study was to re-examine the prevalence, pattern, and severity of incisal wear in dental students, to compare the results obtained in 1991 with those obtained in 1993.

Materials and methods

The study group in 1991 consisted of 64 Norwegian students (39 women, 25 men) who were in their 3rd, 4th, and 5th academic year at the School of Dentistry, University of Bergen, Norway. For information on study design and base-line data, see Silness et al. (7). The time interval between the 1991 and the 1993 examination was about 24 ± 1.0 months. The mean age of the group in 1991 was 23 ± 1.7 years (range, 21–28 years). The study group in 1991 and in 1993 had an average of 28 ± 1.57 teeth. This included 65 erupted third molars. Twenty-six premolars had been removed on orthodontic indications. Two lateral incisors, one in each jaw, were missing (agenesis). One maxillary central incisor in one student had received an artificial crown (trauma). In the same student the neighboring central incisor had received a facial resin laminate for esthetic reasons between 1991 and 1993. In another student one mandibular central incisor had received an incisal composite filling. Therefore, 381 maxillary anterior teeth and 382 mandibular anterior teeth could be re-examined in 1993. Upper and lower jaw dental stone casts (Vel-Mix Stone, Kerr) were obtained using stock trays and silicone-based impression material (Xantopren, L and H). The stock trays were coated with an adhesive (Bayer Universal Adhesive) applied in thin layers.

The impressions for the 1991 set of study casts were all taken in the clinic of the Department of Prosthodontics, School of Dentistry, University of Bergen. To the students who were no longer in the school in 1993 because they had left after final university examination, impression material and stock trays were mailed, in accordance with agreement. The completed impressions were sent back to the dental school to be poured with stone (Vel-Mix Stone, Kerr) for diagnostic casts. Assessment of incisal tooth wear of the six anterior maxillary and mandibular teeth was made on the stone casts in accordance with the Incisal wear Index (IwI) (8). The criteria were as follows: 0 = developmental incisal notches (the mamelones) present; 1 = developmental incisal notches disappeared; 2 = clearly outlined smooth incisal wear facets; and 3 = loss of substance with excavation along the incisal edge ('ditching').

Statistical methods

The kappa statistic (9, 10) was used to measure repro-

Table 1. Means and standard deviations (SD) of incisal tooth wear (IwI) for anterior teeth in Norwegian dental students in 1991 and 1993

Tooth type	1991			1993		
	n	Mean	SD	*n*	Mean	SD
11, 21	127	2.43	0.61	126	2.50	0.57
12, 22	127	1.85	0.70	127	1.94	0.58
13, 23	128	2.25	0.54	128	2.49	0.54
41, 31	127	2.44	0.77	126	2.47	0.72
42, 32	128	1.95	0.74	128	2.00	0.74
43, 33	128	2.10	0.53	128	2.28	0.67

ducibility in scoring the IwI on the stone casts. As reported previously (7), the intra-examiner reproducibility in scoring IwI by observers A and B for the 1991 set of casts ranged from 0.70 for mandibular teeth to 0.89 for maxillary teeth. Final assessment of wear was made jointly by the two observers, and the final results were used in the report. To measure reproducibility for the 1993 set of scores, observers A and B jointly assessed incisal wear twice. The kappa values ranged from 0.84 (mandibular teeth) to 0.92 (maxillary teeth). The results of the second series of these measurements were used for the present report. The present analyses of the IwI scores thus relate to the 1991 and 1993 sets of stone casts. For the analyses of the pattern and severity of incisal tooth wear, means and standard deviations of the IwI scores for the various morphologic tooth types were calculated. The Wilcoxon signed-rank test for matched pairs, which makes use of the size of the differences between measurements (IwI_{1993}–IwI_{1991} = ΔIwI), was used to analyze differences between the 1991 and 1993 measurements for each of the various tooth types. A correction was made for ties in the ranks. Conversion was made to approximate normal deviate, corrected for continuity, Zc, calculated as explained by Snedecor & Cochran (11). The correlation between age and incisal wear (IwI) was examined by using the Spearman rank correlation method for each of the six tooth types included in the study. Chi-square tests used to test the distribution differences of IwI scores between the left and right side of the tooth arches showed that the differences were not statistically significant for any of the six tooth types examined ($p > 0.05$). As a consequence, the right- and left-side IwI scores of each of the identical teeth were combined in the statistical analyses. This was done for the 1991 set of data and for the 1993 set.

Results

In 1991 and in 1993, 13 teeth scored IwI = 0. The mean IwI scores of the six anterior tooth types for the two sets of data are shown in Table 1. In both jaws central incisors had the highest IwI scores, and the lateral incisors the lowest means both in 1991 and in 1993. The canine teeth of both jaws had mean IwI scores between those of central and lateral incisors in 1991. In 1993 the canines (13, 23) had a mean score much alike that of maxillary central incisors. The IwI size differences between 1993 and 1991 for central and lateral incisors of both jaws were small and not statistically significant ($p > 0.05$). For maxillary and mandibular canines the mean $\Delta IwIs$ were 0.24 and 0.17, respectively. These differences were statistically significant ($p < 0.001$ and $p = 0.003$, respectively). The results of the Spearman rank correlation method to examine the relationship between incisal wear (IwI) and age showed that the coefficients varied between $r_s = 0.003$ and $r_s = -0.140$ for the various tooth types in 1993 and were thus not statistically significant for the students aged 23–30 years (mean age, 25 ± 1.7 years).

Discussion

The results of the combined cross-sectional and longitudinal analyses performed in the present study demonstrated that in a population sample with a large number of teeth the prevalence of incisal wear within the anterior teeth had remained essentially the same after 2 years. About 98% of the anterior teeth showed incisal wear in both 1991 and 1993. This is a higher frequency than reported for similar age groups (see, for example, Refs. 1, 2), but comparisons with these works are difficult since other scoring systems were used in describing tooth wear. The data of the 1991 examination showed that in both jaws the severity of wear for the various tooth types differed significantly from each other (7). In both jaws central incisors had the most advanced wear, canine teeth ranked second, and lateral incisors had the least wear. Apparently, this pattern had changed during the 2-year observation period, since in 1993 the severity of wear of maxillary canines had reached the level of central incisors. The finding that incisal wear was not statistically related to age in the narrow 23- to 30-year age range studied is in agreement with findings by Seligman et al. (2), who examined students 19–40 years of age. By contrast, the results of a longitudinal study of schoolgirls and schoolboys aged 8–16 years showed that incisal wear of central and lateral incisors was significantly related to age as measured with the IwI system (12). It was also shown that the strength of this relationship decreased with age. Our findings here that incisal wear in students was not significantly related to age in the age range 23–30 years and that the yearly wear increments for central and lateral incisors were small and not significant may lend support to the assumption that a relatively stable level of wear for these tooth types had been established before the 1991 examination. This assumption received strong support from the results of cross-sectional studies by

Seligman et al. (2), who showed that the severity of wear did not differ in the age groups 19–23 years, 24–28 years, and 29–40 years in both sexes. On the other hand, both maxillary and mandibular canine teeth showed increased severity of wear during the period of observation. In the context of this discussion it seems reasonable to refer to the two main schools of thought with regard to occlusion. Schuyler (13) and others argued for contact of all opposing teeth (group function) in all the various positions of the mandible in centric and excentric positions. D'Amico (14) and others prescribed the cuspid protective theory, which suggests that the only tooth contact in all excentric positions of the mandible should be between cuspids of the two jaws and thereby protect the other teeth from being worn. Scaife & Holt (15), who examined clinically the relationship between functional occlusion and tooth wear (faceting), were of the opinion that the faceting statistics favored the cuspid protective theory. Recently, Johansson et al. (16) studied clinically occlusal factors corresponding to those of Scaife & Holt (15) and concluded that neither the cuspid protective theory nor the group function theory could be substantiated and that more needs to be known about the multifactorial etiology of occlusal tooth wear.

The results of the present study showed an increase of wear of the canine teeth and a concomitant paucity of wear of central and lateral incisors of both jaws during the observation period. Owing to the relatively short observation period it cannot be predicted whether this pattern of wear is part of a cuspid protective mechanism or part of a mechanism gradually developing group function wear. Whether this pattern will persist remains to be learned from the planned future examinations of this study.

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